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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,198	01/20/2004	Katsuji Andou	247709US2	7758
22850	7590	08/02/2006	EXAMINER	
C. IRVIN MCCLELLAND OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			LE, THAO X	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 08/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/759,198	Applicant(s) ANDOU, KATSUJI	
	Examiner Thao X. Le	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) 3, 4 and 6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1-2 and 5 in the reply filed on 19 June 2006 is acknowledged. The traversal is on the ground(s) that the search can be done without serious burden, even though it includes claims to independent or distinct inventions. This is not found persuasive because the search is not coexistent as evidenced by the different fields of search. It is necessary to search for one of the inventions, conductive pipe, in a manner that is not likely to result in finding art pertinent to the other invention, insulating pipe (insulating material) (e.g., searching different classes/subclasses or electronic resources, or employing different search queries) even though the two are classified together.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-2, and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5869883 to Mehringer et al. in view of US 5172213 to Zimmerman and US

6670699 to Mikubo et al. or US 5950714 to Schneider et al. or US 20020185726 to North et al.

Regarding claim 1, Mehringer discloses in fig. 4 a semiconductor device which comprises a conductive heat sink 14, including an outer surface 14a/b including a plane partially formed thereof; a power semiconductor element 8 fixed onto the plane in the outer surface of the conductive heat sink 14 through a bonding layer 11; and an external connecting terminal 17, including an inner lead part including a tip portion bonded onto the plane in the outer surface 14a of the conductive heat sink 14 and an outer lead part 17 continuous with the inner lead part; and a mold resin 13 covering the surface of the power semiconductor element 8, the whole of the inner lead part of the external connecting terminal 17, and the outer surface 14a of the conductive heat sink 14.

But, Mehringer does not disclose a mold resin covers the whole surface of the power semiconductor element; and conductive heat sink comprising a conductive pipe including an inner surface forming an inner space shaping a path of refrigerant liquid.

However, Mikubo discloses a semiconductive device in fig. 11 comprises a semiconductor power device 1, fig. 11, a conductive pipe 10c, col. 13 line 13, including an inner surface forming an inner space shaping a path of refrigerant liquid 14, col. 13 line 16. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to replace the conductive heat sink 14 of Mehringer with the heat pipe 10C teaching of Mikubo, because it would have

enhanced the cooling efficiency and realized in size reduction as taught by Mikubo, see abstract.

In addition, Schneider discloses a semiconductor device in fig. 7 comprises a semiconductor power device 610, col. 5 line 57, a conductive pipe 602, col. 5 line 50, including an inner surface forming an inner space shaping a path of refrigerant liquid, col. 5 line 67. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to replace the conductive heat sink 14 of Mehringer with the heat pipe 602 teaching of Schneider, because it would have improved the device reliability by controlling temperature which high power electric components reach during operation through liquid cooling as taught by Schneider in col. 1 lines 18-22.

Furthermore, North discloses a semiconductor device in fig. 7 comprises a semiconductor power device 10, a conductive pipe 19 including an inner surface forming an inner space shaping a path of refrigerant liquid [0016]. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to replace the conductive heat sink 14 of Mehringer with the heat pipe 19 teaching of North, because it would have reduced thermal resistance of the device as taught by North [0001].

With respect to the mold resin cover the whole surface of the power semiconductor; Zimmerman discloses a semiconductor device in fig. 5 comprises a power semiconductor element 12, a lead 48, and a mold resin covers the whole surface of the power semiconductor element. At the time the invention was

made; it would have been obvious to one of ordinary skill in the art to use the mold resin teaching of Zimmerman with Mehringer's device, because it would have provided the protection to the device.

Regarding claim 2, Mehringer does not disclose the semiconductor device further includes an insulative film formed in the whole of inner surface, the mold resin covers the whole of conductive pipe, and includes a refrigerant liquid inlet continuous with one end portion of said conductive pipe and a refrigerant liquid outlet continuous with the other end portion of said conductive pipe.

However, North discloses the semiconductor device wherein insulative film 22 [0020] formed in the whole of inner surface, and a conductive pipe 19 includes a refrigerant liquid inlet continuous with one end portion of said conductive pipe and a refrigerant liquid outlet continuous with the other end portion of said conductive pipe for the same reason as discussed in the above claim 1.

With respect to the mold resin covers the whole power semiconductor element; see discussion in claim 1.

Regarding claim 5, Mehringer discloses the semiconductor device wherein the power semiconductor element 8 is electrically connected to the inner lead part of the external connecting terminal 17 via the conductive heat sink 14, fig. 4.

Response to Arguments

4. Applicant's arguments with respect to claims 1-2 and 5 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Thao X. Le
27 July 2006